

MARGOSAN-O(R)  
 THE SCOTTS COMPANY  
 14111 Scottslawn Road  
 Marysville, OH 43041  
 In Case of Emergency, call: CHEMTREC  
 1-800-424-9300 For Nonemergency calls: 1-513-644-0011  
 MSDS No.: SIERRA/0070693  
 Revision: 1  
 Date: June 18, 1993

	HEALTH HAZARD	1 - Slight
National Paint and Coatings Association Hazardous Material Identification System	FLAMMABILITY HAZARD	3 - Serious
	REACTIVITY HAZARD	0 - Minimal
	PERSONAL PROTECTION	SEE MSDS SECTION VIII

#### SECTION I. MATERIAL IDENTIFICATION

Trade/Material Name: MARGOSAN-O(R)  
 Description: Botanical Insecticide Concentrate  
 EPA Reg. #11688-5-58185

#### SECTION II. INGREDIENTS AND HAZARDS

Ingredient Name:	CAS Number:	Percent:	Exposure Limits:
Azadirachtin	11141-17-6	0.25%	None Known
Proprietary mixture of ethanol and other formulation compounds	64-17-5*	99.75%	Ethanol: 1000 ppm (Fed. OSHA & Cal/OSHA PEL, ACGIH TLV)

\* Ethanol

This product is not classified as a FLAMMABLE LIQUID for transportation purposes. See Section IX of this MSDS for further information.  
 Exposure limits are for airborne 8-hour time-weighted average exposures, unless otherwise indicated, and apply only to occupational exposures.  
 To the best of Grace-Sierra's knowledge, this product contains no compounds listed as toxic by SARA 313.

#### SECTION III. PHYSICAL DATA

Appearance & Odor: Clear liquid, brown to orange in color. Fragrant odor.  
 Boiling point: 78-212C  
 Vapor pressure: 44 mm @ 20C  
 Water solubility (%): 100% by weight  
 Vapor density (air=1): 1.59  
 Evaporation rate: Slower than butyl acetate  
 Specific gravity (H2O=1): 0.85-0.89  
 % volatile by volume: Not Known  
 Warning Properties: Fragrant odor. Irritation of eyes, nose, and mouth.

#### SECTION IV. FIRE AND EXPLOSION DATA

Flash Point (method): 55.6F - Closed Cup  
 Limits: LEL %: 3.3% UEL %: 19%

NFPA Flammable/Combustible Liquid Classification: Flammable Liquid

NFPA Fire Hazard Symbol Codes:

Flammability: 3

Health: 1

Reactivity: 0

Special:

Extinguishing Media: Carbon dioxide, dry chemical, alcohol or polymer foam. Water spray not recommended as an extinguishing agent, but may be used to cool metal containers.

Autoignition Temp: 798F

Unusual fire and explosion hazards: FLAMMABLE LIQUID. Explosive vapor-air mixtures may be formed above flash point. Ethanol is a dangerous fire and explosion hazard with a low flash point, appreciable vapor pressure, and explosive range in air.

When heated to decomposition, product emits toxic carbon monoxide.

Special fire-fighting procedures: Evacuate area. Avoid inhalation of combustion products. To fight large fires, wear full protective clothing and NIOSH/MSHA approved self-contained breathing apparatus with full facepiece operated in the pressure/demand mode.

#### SECTION V. REACTIVITY DATA

Material is stable. Hazardous polymerization cannot occur.

Chemical incompatibilities: Oxidizers, strong acids, nitrates, acid chlorides, peroxides, reducing metals (e.g. silver), and alkali metals (e.g. potassium).

Conditions to avoid: Heat. Ignition sources such as sparks or open flames.

Contact with oxidizers, strong acids, nitrates, perchlorates, peroxides, and silver and potassium compounds.

Hazardous decomposition Products: Toxic carbon monoxide.

#### SECTION VI. HEALTH HAZARD INFORMATION

This product is not considered a carcinogen by NTP, IARC, or OSHA.

Summary of risks: Information on health effects of exposure to active ingredient (azadirachtin) is limited.

Ethanol vapor is irritating to eyes, nose and respiratory tract. Inhalation of high concentrations (>1000 ppm) may cause headache, drowsiness, inability to concentrate, dizziness, and nausea.

Ingestion of ethanol is moderately toxic. Symptoms are similar to those for inhalation. Long term consumption is linked to liver damage.

□Solvent may be absorbed through intact skin, contributing to total exposure. Prolonged or repeated skin contact may cause defatting (drying) and dermatitis. Direct contact with eyes causes an immediate stinging and burning sensation.

Medical conditions which may be aggravated by contact: Persons with pre-existing skin disorders, or impaired respiratory or liver function may be more susceptible to effects of ethanol.

Target organs: Central nervous system, respiratory tract, eyes, skin, and liver.

Primary entry route(s): Inhalation, ingestion, and skin contact.

Acute effects: See summary.

Toxicological Data for Formulated Product:

Oral LD50 (rat): >5 gm/kg

Inhalation LC50 (rat): >4.9 mg/L

Dermal LD50 (rabbit): >2 gm/kg

Eye Irritation (rabbit): Minimal.

Chronic effect(s): Chronic ingestion of ethanol has been linked to liver damage and cancer in humans.

Signs & symptoms of overexposure:

Eye contact: See Summary  
 Skin contact: See Summary  
 Inhalation: See Summary  
 Ingestion: See Summary

First aid:

Eye contact: Flush thoroughly with running water for 15 minutes, lifting upper and lower lids occasionally. Get medical attention immediately.  
 Skin contact: Remove contaminated clothing. Wash skin with soap and water. Get medical attention if irritation develops or persists.  
 Inhalation: Remove victim to fresh air. Get medical attention for any breathing difficulty.  
 Ingestion: If swallowed, induce vomiting by giving two glasses of milk or water and sticking finger down throat. Call physician immediately. Never give anything by mouth to an unconscious or convulsing person.  
 Seek medical help for further treatment, observation, and support after first aid.

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 SECTION VII. SPILL, LEAK AND DISPOSAL PROCEDURES  
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Spill/Leak procedures: Extinguish all possible heat and ignition sources. Provide spark proof/explosion proof ventilation. Cleanup personnel should use protective clothing and respiratory protection. Use non-sparking tools during cleanup. Spill may be diluted with water to raise flash point. Avoid misting conditions during cleanup. If material is uncontaminated, collect and reuse as recommended for product. If contaminated, absorb with dry absorbent and put in appropriate container and dispose. Keep spills away from drinking water supplies. After cleaning up spill, flush area with water. Do not allow water to contaminate surrounding area.  
 Waste management/Disposal: If product is not contaminated, collect and reuse as recommended for product. If product is contaminated, dispose of in an approved landfill disposal facility, in accordance with applicable federal, state, and local regulations.

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 SECTION VIII. SPECIAL PROTECTION INFORMATION  
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Personal protective equipment:

Goggles: Use chemical goggles and/or faceshield when mixing or spraying to prevent eye irritation or injury caused by mist or splashes. Contact lenses should not be worn when working with this material.  
 Gloves: Wear polyethylene gloves to prevent exposure by skin absorption.  
 Respirator: If it is likely that the TLV will be exceeded, wear NIOSH/MSHA approved full facepiece pesticide respirator (combination organic vapor cartridge and pesticide particulate pre-filter). For exposures exceeding the maximum use concentration of the respirator, wear a self-contained breathing apparatus operated in the pressure/demand mode.  
 Other: Clean body-covering clothing should be worn.

Workplace considerations:

Ventilation: None required for routine outdoor use. If product is used indoors, spark proof/explosion proof local exhaust ventilation is recommended to prevent dispersion of the contaminant into workroom air.  
 Safety stations: Maintain eye wash station in work area.

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 SECTION IX. SPECIAL PRECAUTIONS  
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Storage segregation: Keep in tightly closed container. Store in a cool, dry area away from incompatible materials (see Section V of this MSDS). Store away from water, feed, and foodstuffs. Protect container from physical damage.  
 Special handling/storage: KEEP OUT OF REACH OF CHILDREN. Pesticide, spray mixture, or rinse water that cannot be used according to label instructions

must be disposed of according to approved procedures (see Section VII of this MSDS). Dispose of container in an approved waste facility.

Engineering controls: None required for routine outdoor use.

Other precautions: Wash hands with soap and water after handling product.

Proper Shipping Name: Alcohol, N.O.S. (Ethanol)

Shipping Container Markings: Alcohol, N.O.S. (Ethanol), UN 1987

Shipping Container Labeling: Flammable Liquid

Hazard Class: 3

Packing Group: II

Transporter Placarding: Flammable Liquid

IMPORTANT NOTE: When this product is packaged in limited quantity containers (that is, in one-quart containers packed in strong outer packagings) as per CFR 173.150, it does not require Shipping Container Labeling, except when being transported by aircraft, and does not require Transporter Placarding.

DOT Class: FLAMMABLE LIQUID

UN Register: UN 1987

Prepared/revised by: M. Lowman

September 27, 1993

The information provided in this material safety data sheet applies only to the intact product used as directed on the package label.

The information contained herein is provided in good faith and is believed to be correct as of the date hereof. However, Grace-Sierra makes no representations as to the comprehensiveness or accuracy of the information.

It is expected that individuals receiving the information will exercise their independent judgement in determining its appropriateness for a particular purpose. Accordingly, Grace-Sierra will not be responsible for damages of any kind resulting from the use of or reliance upon such information.

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# **E X T O X N E T**

## **Extension Toxicology Network**

A Pesticide Information Project of Cooperative Extension Offices of Cornell University, Michigan State University, Oregon State University, and University of California at Davis. Major support and funding was provided by the USDA/Extension Service/National Agricultural Pesticide Impact Assessment Program.

**Pesticide  
Information  
Profile**

## **Azadirachtin**

### **~~TRADE OR OTHER NAMES~~**

The active ingredient azadirachtin is found in commercial insect growth regulators. Some trade names for products containing azadirachtin include Align, Azatin and Turplex (1, 2). Formulations include a 10% plant extract (technical) and a 3% EC (2).

### **REGULATORY STATUS**

Azadirachtin is registered in the United States as a general use pesticide with a toxicity classification of IV (relatively non-toxic). Check with specific state regulations for local restrictions which may apply. Products containing azadirachtin must bear the signal word "Caution" or "Warning" on their label (1).

### **INTRODUCTION**

The key insecticidal ingredient found in the neem tree is azadirachtin, a naturally occurring substance that belongs to an organic molecule class called tetranortriterpenoids (6). It is structurally similar to insect hormones called "ecdysones," which control the process of metamorphosis as the insects pass from larva to pupa to adult. Metamorphosis requires the careful synchrony of many hormones and other physiological changes to be successful, and azadirachtin seems to be an "ecdysone blocker." It blocks the insect's production and release of these vital hormones. Insects then will not molt, thus breaking their life cycle (4, 5). Azadirachtin may also serve as a feeding deterrent for some insects. Depending on the stage of life-cycle, insect death may not occur for several days. However, upon ingestion of minute quantities, insects become quiescent and stop feeding. Residual insecticidal activity is evident for 7 to 10 days or longer, depending on insect and application rate (1, 2). Azadirachtin is used to control whiteflies, aphids, thrips, fungus gnats, caterpillars, beetles, mushroom flies, mealybugs, leafminers, gypsy moths and others on food, greenhouse crops, ornamentals and turf (2, 11).

### **TOXICOLOGICAL EFFECTS**

#### **ACUTE TOXICITY**

The acute oral toxicity in rats fed technical grade azadirachtin ranged from greater than 3,540 mg/kg to greater than 5,000 mg/kg, the highest dose tested when administered undiluted to albino rats (1, 2, 3).

The single-dose oral toxicity LD50 of the formulated product Azatin-EC fed to rats was 4,241 mg/kg; considered practically nontoxic (8).

The acute inhalation toxicity study in rats exposed to technical azadirachtin showed that the acute inhalation LD50 is greater than 2.41 mg/L per animal, the highest dose tested. Although this figure is below the 5.0 mg/L limit test dose for an acute inhalation study, the reported concentration was the maximum dose possible under the test conditions. No deaths occurred during the course of the study. Azadirachtin was given a toxicity classification of Category III (3).

The 4-hour acute inhalation LC50 in rats exposed to the formulated product Azatin-EC was >2.18 mg/kg (8).

A primary eye irritation study in rabbits exposed to technical azadirachtin was rated mild to moderately irritating after instillation of 0.1 gm of the undiluted material. At one hour post-instillation, the maximum eye irritation score was 15.3/110; by 24, 48, and 72 hours the scores were 6.2/110, 0.3/110, and 0/110, respectively. It was given a toxicity category of III (3).

Primary dermal irritation in rabbits when tested at a single dose (0.5 gm) by applying it to the shaved backs of rabbits, did not cause any dermal irritation after 4 hours of exposure. The dermal score was zero for all treated rabbits at all examination times. A toxicity category of IV, mild to slightly irritating, was assigned.

An acute dermal toxicity study of rabbits exposed to technical azadirachtin was performed. The material was applied for 24 hours at a single dose of 2.0 gm/kg to the shaved backs of the rabbits, that caused dermal irritation which resolved by day nine. Azadirachtin was classified as a mild irritant (3). Another study reported the dermal LD50 for rabbits to be >2,000 mg/kg (1, 2).

Dermal sensitization in guinea pigs found the technical end-use product to be categorized as a mild sensitizer when administered undiluted to albino guinea pigs. The test material was considered a weak dermal sensitizer to albino guinea pigs (3).

## CHRONIC TOXICITY

A 90-day oral toxicity study in rats fed levels of 500, 2500, and 10,000 ppm of azadirachtin showed no signs of overt systemic toxicity at any dose level after 90 days of feeding. Mean body weight was significantly decreased in the 10,000 ppm males and females at weeks 3 and 4, respectively. This persisted for the duration of the 90-day feeding period (11).

### Reproductive Effects

Male antifertility activity of neem leaf extract was studied in mice, rats, rabbits and guinea pigs by daily oral feeding of a cold-water extract of fresh green neem leaves. The infertility effect was seen in treated male rats as there was a 66.7% reduction in fertility after 6 weeks, 80% after 9 weeks, and 100% after 11 weeks. There was no inhibition of spermatogenesis. During this period there was no decrease in body weight and no other manifestation of toxicity observed. There was a marked decrease in the mortality of spermatozoa. The infertility in rats was not associated with loss of libido or with impotence and the animals maintained normal mating behavior. The male antifertility activity was reversible in 4 to 6 weeks. Neem extract also shows reversible male antifertility activity in mice without inhibition of spermatogenesis. In guinea pigs and rabbits, however, it exhibited toxicity as demonstrated by 66.6% and 74.9% mortality in guinea pigs and 80 and 90% mortality in rabbits at the end of 4 and 6 weeks,

respectively (9).

### **Teratogenic Effects**

No information was found.

### **Mutagenic Effects**

Technical azadirachtin was evaluated for the potential to cause gene mutations in the *S. typhimurium* strains at any dose (5, 50, 500, 5,000 micrograms/plate) with or without S-9 activation. The study was negative (3).

The Ames test was negative with or without metabolic activation for the formulated product Azatin-EC. The UDS and Mouse Lymphoma studies were also negative (8).

### **Carcinogenic Effects**

No information was found.

### **Organ Toxicity**

Rats dosed with 600 mg/kg/day of the formulated product Azatin-EC for 90 days showed no overt adverse effects on target organs (8).

### **Fate in Humans and Animals**

No information was found.

## **ECOLOGICAL EFFECTS**

### **Effects on Birds**

No significant effects on other wildlife were reported (8).

### **Effects on Aquatic Organisms**

The formulated product Azatin-EC is not expected to kill fish at recommended rates. The LC50 for rainbow trout exposed to azadirachtin is 0.48 ppm (11). It may cause significant fish kill if large concentrations reach waterways. It breaks down rapidly (in 50-100 hours) in water or light, and is not likely to accumulate or cause long-term effects (8, 11).

### **Effects on Other Animals (Nontarget species)**

Azadirachtin is relatively harmless to spiders, butterflies, and insects such as bees that pollinate crops and trees, ladybugs that consume aphids, and wasps that act as parasites on various crop pests. This is because neem products must be ingested to be effective. Thus, insects that feed on plant tissue succumb, while those that feed on nectar or other insects rarely contact significant concentrations of neem products.

Another study found that only after repeated spraying of highly concentrated neem products onto plants in flower were worker bees at all affected. Under these extreme conditions, the workers carried contaminated pollen or nectar to the hives and fed it to the brood. Small hives then showed insect-growth-regulating effects; however, medium-sized and large bee populations were unaffected (4).

A study of neem products and their effect on mortality, growth and reproduction of earthworms in soils was conducted. Positive effects on weight and survival were found in soil treated with ground neem leaves and ground seed kernels under greenhouse conditions. Reproduction was slightly favored over a period of 13 weeks in a neem-enriched substrate in rearing cages. Various neem products were incorporated in the upper 10-cm soil layer of tomato plots. None of the materials had negative side effects on seven species of earthworms (10).

No significant effects on other wildlife were reported (8).

## **ENVIRONMENTAL FATE**

### **Breakdown of Chemical in Soil and Groundwater**

Potential for mobility in soil is very low for the formulated product Azatin-EC. Accumulation in the environment is not expected (8).

### **Breakdown of Chemical in Surface Water**

The formulated product Azatin-EC which contains the active ingredient azadirachtin is considered a water pollutant. It breaks down rapidly (in 100 hours) in water or light, and will not cause long-term effects (8).

### **Breakdown of Chemical in Vegetation**

Azadirachtin is considered non-phytotoxic when used as directed (2).

## **PHYSICAL PROPERTIES AND GUIDELINES**

Azadirachtin is a tetranortriterpenoid botanical insecticide of the liminoid class extracted from the neem tree *Azadirachta indica*. It is a yellow-green powder, with a strong garlic-sulfur odor. Hazardous combustion products include carbon monoxide and carbon dioxide (1, 2, 8, 11).

### **Physical Properties:**

<b>CAS No:</b>	11141-17-6
<b>Chemical name:</b>	azadirachtin (1)
<b>Chemical Class/Use:</b>	Tetranortriterpenoid/Insect growth regulator (1, 8)
<b>Specific gravity:</b>	1.066 (Azatin-EC) (8)
<b>Solubility in water:</b>	0.00005 (1)
<b>Boiling point:</b>	78-212 degrees F (Margosan-O) (7)
<b>Flashpoint:</b>	>140 degrees F (1); >145 F (Azatin-EC) (8); 55.6 degrees F (Margosan-O) (7)



**Vapor pressure:** >2 mmHg @ 25 degrees C (Azatin-EC) (8); 44mm @ 20 degrees C (Margosan-O) (7)  
**Kow:** 12.3; partitioning from water to oil is relatively high (Azatin-EC) (8)

## BASIC MANUFACTURER

AgriDyne Technologies Inc.  
2401 S. Foothill Dr.  
Salt Lake City, Utah 84109  
Phone: 800-657-3090  
Fax: 801-467-1090

### Review by Basic Manufacturer:

Comments solicited: April, 1995  
Comments received: May, 1995

## REFERENCES

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For more information relative to pesticides and their use, please contact the PMEP staff at:

5123 Comstock Hall  
Cornell University  
Ithaca, New York 14853-0901  
(607)-255-1866



Last Modified: 03/01/2001

Questions regarding the information and development within this web site should be directed to the PMEP Webmaster.

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**Disclaimer:** Please read the pesticide label prior to use. The information contained at this web site is not a substitute for a pesticide label. Trade names used herein are for convenience only. No endorsement of products is intended, nor is criticism of unnamed products implied.

<b>Manufacturer Name and Address:</b>  VANSON, INC.  8840 152 <sup>nd</sup> Avenue NE  Redmond, Washington 98052  Emergency Phone: 425-881-6464	<b>Material Safety Data Sheet</b>  <b>CHITOSAN</b>
<b>1 Product Identification</b>	
Trade name: Chitosan	
<b>2 Composition</b>	
Chitosan  Chemical names:  Source	CAS # 9012-76-4  beta-(1,4)-2-amino-2-deoxy-D-glucose, or  poly-D-glucosamine, or poly N-acetyl-D-glucosamine  Chitin extracted from recycled crab and shrimp shells.
<b>3 Physical/Chemical Characteristics</b>	
Appearance and odor	Chitosan a fine, off-white; odorless; and tasteless powder.
Solubility	Insoluble in water and alcohols  Soluble in dilute organic acids.
Chemical formula	$C_6H_{11}NO_4$
Molecular weight	161
Density	0.5 - 0.6 g /cc

4 Toxicological Data	
Acute oral, LD50 (mice)	> 10 g / kg

5 Fire & Explosion Hazard Data	
Flash Point	Not Applicable  Keep away from oxidizing agents and avoid open flames. Product may ignite at temperatures In excess of 400° F.  Depending on moisture content, and particle size, airborne dust of Chitosan might explode in the presence of an ignition source. It comparable to flour and wood dust.  Use water, dry chemicals, carbon dioxide, sand, or foam.
Flammability	
Unusual Fire and Explosion Hazards	
Fire Fighting Media	
6 Health Hazards Information	
Acute Health Effects - Signs and Symptoms of Exposure, Emergency and First Aid Procedures	EYE CONTACT: Chitosan powder may cause mechanical irritation. Treat powder in eye as foreign object. Flush with water to remove.
	SKIN CONTACT: The powder can cause irritation or rash. Seek medical help if it persists.
	INHALATION: Chitosan may aggravate preexisting respiratory conditions or allergies. It may accumulate on linings of the nose and lungs resulting in dryness and coughing. Remove to fresh air. Get medical help if persistent irritation or breathing difficulties occur.
	INGESTION: Not likely to be hazardous if ingested.

Potential Chronic Health Effects	There is no known effect from chronic exposure to this product.
Carcinogenicity	Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA

<b>7 Personal Protective Equipment</b>	
Respiratory protection	A NIOSH/MSHA-approved respirator is recommended when the dust is airborne
Protective gloves	Not required. However cloth or plastic gloves are recommended to minimize potential mechanical irritation from handling.
Eye protection	Goggles are recommended when there is a high level of airborne dust.
Other protective clothing	Not needed
<b>8 Regulatory</b>	
TSCA	Not listed on the TSCA inventory
SARA Section 302	Does not have an RQ or TPQ
SARA Section 313	Not reportable under Section 313
Clean Air Act	This material does not contain any hazardous air pollutants.
Clean Water Act	Not listed as Hazardous Substance, Priority Pollutant or Toxic Pollutant
OSHA	Not considered hazardous
DOT	Shipping name: Chitosan Class: 50, Not regulated
<b>9 Storage, Handling and Disposal</b>	
Storage	Store in a cool, dry place away from open flames

	and strong oxidizers.
For spills of Chitosan	The material may be vacuumed or collected for recovery or disposal.
Waste disposal method	Land disposal is acceptable. The material is biodegradable. Follow local, state, and federal regulations.
Work / hygiene practices	Follow good hygienic and housekeeping practices. Clean up areas where Chitosan dust settles to avoid excessive accumulation of this combustible material. Minimize blowdown, sweeping, or other practices that generate high airborne dust concentrations.
<b>Prepared by:</b> Gordon Sargent	<b>Revision Date:</b> September 7, 1998

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